Response

Overview

The term "response", as defined in the National Preparedness Goal, refers to those capabilities necessary to save lives, protect property and the environment, and meet basic human needs after an incident has occurred. This section of the Homeland Security Enterprise (HSE) Geospatial Concept of Operations (GeoCONOPS) describes how the geospatial community supports the Response Mission. Content in this section of the GeoCONOPS complements relevant National Planning Frameworks and their associated Federal Interagency Operation Plans (FIOPs).

Geospatial functions play an important role in supporting the Response Mission. Geospatially enabled decision support facilitates shared situational understanding essential for whole community efforts to understand and communicate risk, build and sustain core capabilities that promote a secure and resilient nation against our greatest risks, and plan to deliver those capabilities to stabilize communities and meet the needs of survivors affected by disaster. Geospatial technology, smart practices, and operational procedures for prevention, protection, mitigation, and recovery are discussed in their respective sections of the GeoCONOPS.

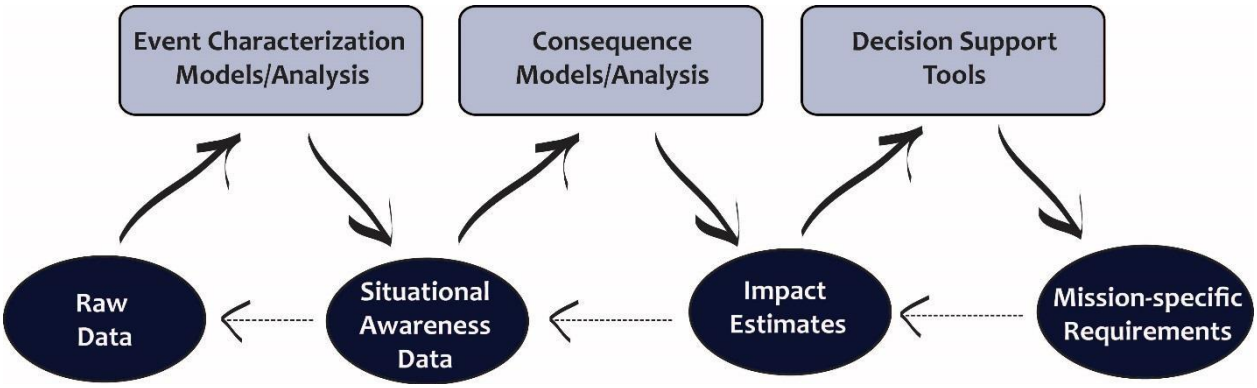


Figure 1:Geospatial functions play an important role in supporting the Protection mission, facilitating shared situational understanding built from authoritative data that can be analyzed to characterize an incident, predict potential consequences, and support decisions.

Shared situational understanding – built from authoritative or best available data that can be used holistically to characterize an incident, predict potential consequences, and support unified decision making – transforms individual data sets into actionable information that can change outcomes, meet the needs of survivors, and build a resilient community. Analyzing hazards, consequences, and potential courses of action in a common geospatial language such as the US National Grid (USNG) increases the level of precision in characterizing threats and facilitates quantifying vulnerabilities, consequences, and resources needed to save and sustain live, stabilize affected communities, protect property and the environment, and met basic human needs.

Geospatial infrastructure, operators, and knowledge are critical components that cross all mission areas and operations. Examples of how geospatial capabilities support the response mission include:

- Modeling and visualization, which can transform data into actionable information.

- Reconnaissance and Remote Sensing provides for collection atmospheric information and imagery that support understanding of conditions on the ground before, during, and after an incident.
- Ability to analyze, model, process, exploit, display, and share data and information required to support the mission.
- Global Positioning Systems (GPS) provide the ability to perform accurate location, tracking, orientation, timing, and measurements necessary to support the whole community.
- Trained analysts that provide the knowledge, skills, and abilities needed for effective use of geospatial capabilities to support decision making.

These geospatial capabilities support response efforts to:

- Understand and communicate risk
- Examine and project potential effects of a threat or hazard on communities, economy, infrastructure, and the environment before or after an incident
- Develop plans for delivering core capabilities needed to respond to and recover from the consequences of any threat or hazard
- Establish and maintain situational awareness across disciplines to ensure unified response efforts
- Anticipate, identify, adjudicate, and employ resources to stabilize communities and change outcomes for survivors
- Monitor (visualize) progress and effectiveness of response efforts

Stakeholders

Effective response depends on integration of the whole community to deliver a unified response through a layered unity of effort. Response stakeholders can be grouped into the following groups:

- Individuals, Families, and Households – Many individuals have talents and experience that can contribute to delivering response core capabilities through community organizations, by participating in community preparedness activities, such as CERT, and by ensuring they have household/family plans.
- Communities – Communities bring people together in a variety of ways that provide opportunities for sharing information and promoting collective action.
- Private Sector – Private sector entities support delivering response core capabilities by collaborating with emergency management personnel before an incident occurs to determine how they can support local response operations and identify assistance needed.
- Nongovernmental Organizations (NGOs) – NGOs manage volunteers and resources that can serve as force multipliers in support of effective unified response operations. As members of their communities, local NGOs are often community trusted-agents with essential knowledge of local needs and assets.
- Local Governments – Disasters begin and end locally. The responsibility for responding to natural and manmade incidents with recognizable geographic boundaries begins with individuals and public officials in the county, parish, city, or town affected.
- State, Tribal, and Federal Governments – State and Tribal governments supplement local efforts before, during, and after an incident by applying in-state resources first. Should State's anticipate their resources may be exceeded, the governor may request assistance from other states or the Federal Government.

- National Guards – National Guard members are an important state and federal resource with expertise in critical areas like communications, logistics, civil engineering, emergency medical response, decontamination, and CBRN response and planning.

Who does Response? In support of local, state, and tribal response operations, the Federal Government works to quickly deploy resources to communities affected by large, complex, or catastrophic incidents. Federal departments and agencies carry out their response authorities and responsibilities pursuant to Presidential directive. Federal departments and agencies have a variety of responsibilities regarding response. Various federal departments and agencies may have statutory responsibilities and lead roles based on unique circumstances of an incident. The National Response Framework (NRF) serves as a guide for how the Nation responds to all types of disasters. Descriptions of statutory authorities and how the following organizations engage and contribute to the delivery of response core capabilities can be found in the NRF and associated Federal Interagency Operations Plan (FIOP):

- State, Tribal, Territorial, and Insular Area Governments
- Non-Governmental Organizations
- Department of Homeland Security
- Federal Emergency Management Agency
- Department of Agriculture
- Department of Commerce
- Department of Defense
- Department of Energy
- Department of Health and Human Service
- Department of Interior
- Department of State
- Department of Transportation
- Department of Treasury
- Environmental Protection Agency
- General Services Administration
- U.S. Army Corps of Engineers

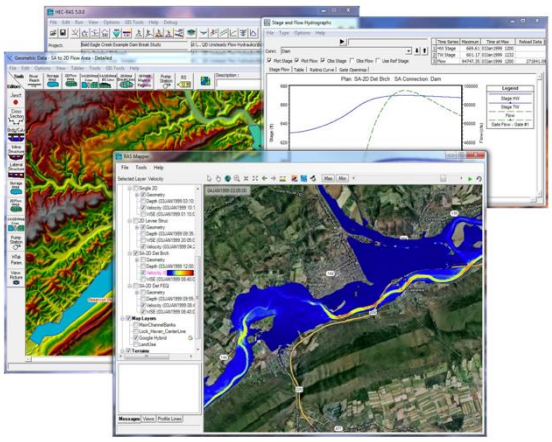
Geospatial Resources

Geospatial Capabilities, including specific technical tools, models, and applications, are critical components needed to support geospatially enabled response planning and decision making. Response mission partners should make every effort to become familiar with geospatial tools during normal operations to reliably access and interpret information. Employing location-enabled data and geospatial tools help explain where people and critical infrastructure are located, support projecting and visualizing consequences, and give context that supports response efforts. Once an event occurs, those involved in disaster operations are likely to use only those tools with which they are already familiar – datasets, models, and other geospatial tools are no different. The utility of geospatial tools depends on their use during normal operations and for exercises and training. Example of geospatial capabilities and tools that support the Response mission are discussed below:

1. **Planning and Operational Coordination** are essential to the Response Mission. Agencies must be able to identify, process, and comprehend geospatial information that promotes shared situational understanding and supports achieving the National Preparedness Goal of a secure and resilient Nation that can deliver response core capabilities through a unity of effort to:

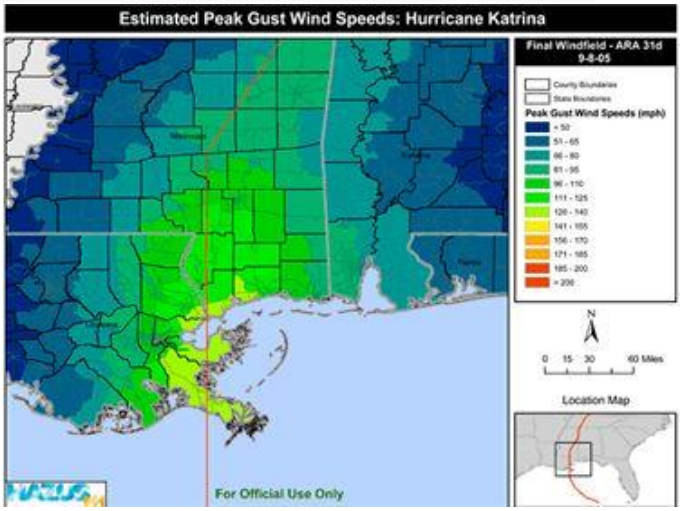
- save and sustain life
- stabilize communities
- meet the needs of survivors
- protect property and the environment.

a. Inundation effects of a dam/levee or precipitation event can be modeled using the Hydrologic Engineering Center (HEC) River Analysis System (HEC-RAS) tool. This US Army Corps of Engineers (USACE) tool predicts extent, depth, and velocity of flooding in an area over time such an event. HEC-RAS is also used by other agencies to develop inundation map libraries for specific locations.



During events this tool can be used to create inundation maps to depict extent and depth of riverine flooding for an area of interest. Inundation map libraries created using HEC-RAS during normal operations could inform risk assessments examining potential future flooding events that can be referenced if an event does occur. Additional information about HEC-RAS can be found at http://gis.fema.gov/Model-and-Data-Inventory/index.html#resource/123 or http://www.hec.usace.army.mil/software/hec-ras/.

b. Hazus-MH estimates potential effects of hurricane wind and surge, earthquakes, and flood. This modeling tool can be used for planning and quickly employed to support response operations for hurricane wind and surge or earthquake incidents. Use for riverine flood events requires additional data collection, assumptions, and data processing to perform complex hydrological modeling that can take longer than time available for early response operations.



Several data sources are integrated into HAZUS-MH including:

- AHA Hospital Location Data
- Transportation infrastructure and network data from the Department of Transportation (DOT) National Transportation Atlas Database (NTAD)
- Elevation data from the US Geological Survey (USGS) National Elevation Dataset (NED) are accessed directly from the model for flood modeling
- Education data is from the Integrated Postsecondary Education System Data (IPEDS) and the Department of Education Common Core Data (CCD)

Event specific consequence analysis to project displaced households likely to seek shelter, number and type of essential facilities damaged, estimates of debris and number of trucks need for debris removal can be derived from HAZUS-MH model runs using historic or incident data as it becomes available from NOAA's Hurricane Center or USGS for earthquakes. Additionally, HAZUS-MH can be used for estimating economic losses from damaged structures, lost jobs and business interruptions, damage to infrastructure and buildings, and potential casualties (earthquakes only). Additional information about HAZUS-MH can be found at http://gis.fema.gov/Model-and-Data-Inventory/index.html#resource/114 or https://www.fema.gov/hazus.

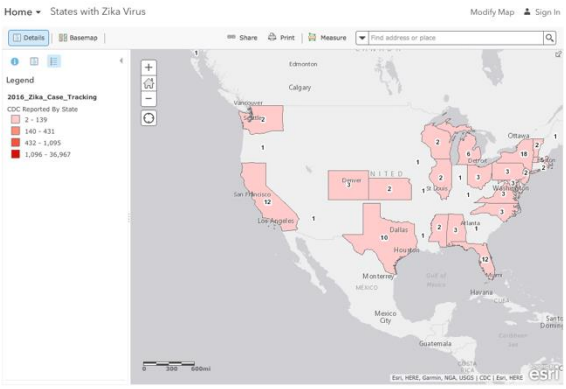
2. **Critical Transportation** provides transportation (including infrastructure access and accessible transportation services) for response priority objectives, including evacuation of people and animals, and delivery of vital response personnel, equipment, and services into the affected areas. There are a number or data resources for transportation:
    a. The National Transportation Atlas Database has downloadable transportation data including critical infrastructure.



    b. Topologically Integrated Geographic Encoding and Referencing (TIGER) contain such critical infrastructure data such as roads and railroads as well as statistical geographical areas to help determine interdependencies and relationships of the data.
3. **Environmental Response/Health and Safety** are core capabilities needed to ensure protection of the health and safety of the public and workers, as well as the environment, from all-hazards in support of responder operations and affected communities. A wide range of geospatial tools are available to:
    - identify and assess worker health and safety hazards to response and recovery workers
    - evaluate effects to the environment, natural and cultural resources, and historic properties
    - assess hazards to minimize public exposure to environmental hazards and support implementation of public protective actions.

    Examples of geospatial resources that support environmental response or health and safety activities are listed below. Additional resources can be explored on the DHS's Model and Data Inventory. The inventory is the result of a federal interagency effort led by FEMA and the Modeling and Data Working Group (MDWG).

a. GeoHEALTH is an interactive mapping system and situational awareness viewer used by the Department of Health and Human Services (HHS). GeoHEALTH incorporates a variety of data to facilitate emergency management planning, pre-event preparedness, and response. Available data include infrastructure locations, medical facility data, hazard imagery, and real-time HHS emergency management resource locations and information. GeoHEALTH contains information regarding medical facilities (e.g., hospitals, trauma centers, nursing homes, pharmacies), other specific types of infrastructure (e.g., Red Cross shelters, daycare centers, and grocery stores), and Census tract-level demographic data (e.g., poverty levels, languages spoken, and physical conditions).



GeoHEALTH also draws information from Google Street View, WeatherBug, high-resolution healthcare facility data from Billian's HealthDATA, financial data and business directories from Dun and Bradstreet, business data from Hoover's, Inc., and hospital bed availability counts from HAvBED. Additionally, GeoHEALTH provides access to real-time satellite imagery for weather conditions and other hazards, and it can be used to visualize energy system disruptions through EAGLE-I. More information on GeoHEALTH can be found at http://gis.fema.gov/Model-and-Data-Inventory/index.html#resource/104.

b. Developed at Argonne National Labs, the RESidual RADioactivity (RESRAD) family of codes can be used to analyze potential human and biota radiation exposures from the environmental contamination of RESidual RADioactive materials. These codes can be used to develop cleanup and decontamination criteria for residual radioactive material and assess associated radiation dose or risks. Codes relevant to improvised nuclear device (IND) detonations are RESRAD, RESRAD-BUILD, RESRAD-OFFSITE, and RESRAD-RDD. Using pathway analysis to evaluate radiation exposure and associated risks, these codes help derive cleanup criteria or authorized limits for radionuclide concentrations in the contaminated source medium. The RESRAD family of codes is widely used by regulatory agencies, the risk assessment community, and universities in countries around the world.

- RESRAD computes soil cleanup guidelines using radioactive material concentrations that will comply with dose- or risk-based cleanup or release requirements. It predicts annual doses or lifetime risks to workers or members of the public resulting from exposures to residual radioactive material in soil, predicts concentrations of radionuclides in various media resulting from residual radioactivity in soil, and supports an "as low as reasonably achievable" analysis or a cost-benefit analysis to aid in the cleanup decision making process.
- RESRAD-BUILD is designed to evaluate the radiation doses from residual radioactivity in buildings.

- RESRAD-OFFSITE evaluates the radiological dose and excess cancer risk to an individual who is exposed to radiation while located within or outside the area of initial contamination.
- RESRAD-RDD can be used to generate cleanup guidelines for an RDD event or a related radiological event based on dose criteria, user-specified assumptions, and environmental transfer parameters that correspond to exposure pathways.

More information about RESRAD can be found at http://gis.fema.gov/Model-and-Data-Inventory/index.html#resource/253.

4. **Public Information and Warning** is important for reaching populations within the affected community to communicate protective measures and current information about short term assistance, including housing, food, water, and transportation.
    a. FEMA and its federal partners, the Federal Communications Commission (FCC), the NOAA NWS, and the DHS Science and Technology Directorate (DHS S&T), worked together to transform the national alert and warning system to enable rapid dissemination of authenticated alert information over as many communications channels as possible. Integrated Public Alert and Warning System (IPAWS) provides a broad range of message options and communications pathways for the delivery of alert and warning information to the American people during and after a disaster.
    b. The Geo-Targeted Alerting System (GTAS) is a collaboration from DHS, NOAA, and FEMA in partnership with IPAWS for plume modeling. It estimates the affected area during a HAZMAT incident and can provide guidance during the Response Mission.
    ~~b.~~c. The Interagency Modeling and Atmospheric Assessment Center (IMAAC) specializes in plume modeling and provide federal position during an actual or potential incident involving hazardous material releases.
    ~~c.~~d. USGS Prompt Assessment of Global Earthquakes for Response (PAGER) uses ShakeMap results to compute the population exposed to each level of shaking intensity allowing for targeting alerts.
    ~~d.~~e. USGS also provides Volcanos and Current Activity Alerts for response during volcano eruptions.
5. **Mapping and Visualization** conveys context, relationships, and dependencies that help characterize an event as well as supports understanding consequences to the affected community, property and the environment, and infrastructure. Visualizing context using geospatial resources transforms data into actionable information that can elevate shared understanding of a situation.
    a. The DHS Geospatial Information Infrastructure (GII) is a tool that allows users to create maps, upload, publish, and share their own data, and view loaded federal data and critical infrastructure. User can also perform geospatial analysis, filter, query, and export data, and use built in apps for better visualization for maps and data.
    b. The National Map (TNM) is a collaborative effort among the USGS and other local, state, and federal partners to improve and deliver topographic information for the Nation. TNM is easily accessible on the Web or as products and services. Downloadable data, including aerial photographs, elevation, hydrography, land cover, boundaries, transportation networks, and more can be accessed through TNM. Other geographic information can be added within the viewer or to create specific types of maps or map

views. The National Map is a significant contribution to the National Spatial Data Infrastructure(NSDI).

c. San Diego State University Visualization Center specializes in organizing and delivering geospatial data over networks for emergency response and helps to represent relationships between people and organizations.
d. ShakeMap, from USGS, generates color-coded maps of the spatial variations of shaking intensity for earthquakes, indicating areas with the strongest shaking in simple visual patterns.
e. HURREVAC provides estimates on evacuation decisions using modeled hurricane track information from NOAA/NWS and data from the HURREVAC study for the area.

GeoData and Products are crucial components for ensuring the Nation can respond effectively to any incident regardless of threat or hazard, scale, or complexity and deliver the core capabilities needed to save lives, protect property and the environment, meet basic human needs, stabilize the incident, restore basic services and community functionality, and establish a safe and secure environment

1. **Data, imagery, and analysts** capable of putting it all together, give spatial context to populations, the built environment, terrain, weather, available support, or other elements of information that may inform response operations. Geospatial context – bringing together location-enabled data such as those mentioned above – allows analysts, operators, and decision makers to characterize an event, project consequences, and take effective action to change outcomes for survivors and their communities.
    a. A broad range of datasets can be explored through the DHS Model and Data Inventory. The inventory is cataloged using metadata tags to organize and analyze models and datasets and maximize effective use for emergency management. Metadata categories include: the dataset/model's full name, abbreviation, model/data, owner, users, upstream inventory datasets/models, downstream inventory datasets/models, relevant hazards, Core Capabilities supported, Emergency Support Functions (ESFs) supported, Recovery Support Functions (RSFs) supported, keywords, function tags, resource type, data collection method, phase specific utility, access information, access type, processing requirements, refresh rate, last known version, programming language, output file types, technical contact information, contact during activation, website, and a brief summary of its function and use.
2. **Restoring Infrastructure Systems** is a critical for stabilizing affected communities, reducing or mitigating secondary and tertiary cascading effects to other communities, and enables emergency response operations. Resources available for critical infrastructure data include:
    a. Homeland Infrastructure Foundation Level Data (HIFLD), previously known as HSIP, provides users with nationwide, geospatially enabled infrastructure data assembled from a variety of federal agencies and commercial sources. HIFLD data are used by a diverse group of downstream models and datasets for several different applications that require infrastructure data, including economic analysis, electrical power modeling, and debris estimation.
    b. The Department of the Interior's Environmental Dataset Gateway (EDG) allows for searching of publicly available data resources keys to protection such as agriculture, energy, health, waste, and water.
    c. The GeoPlatform Marketplace enables users to locate potential partners in acquiring similarly needed geospatial data used for Response.

3. **Mass Care Services** include emergency shelters and other temporary housing options for affected populations. They may also include relocation assistance or interim housing solutions for families unable to return to their pre-disaster homes.
    a. The Red Cross National Shelter System (NSS) provides data for potential shelter facilities in support of disasters.
    b. HUD Geospatial Data is HUD's gateway to geospatial housing data that may assist in the Response Mission.
4. **Public Health and Medical Services**
    a. Center for Disease Control GIS Data Sources makes available public datasets in four topic areas; Public Health Resources, GIS Data, Social Determinants of Health Resources, and Environmental Health Data Resources.
    b. **Situational Awareness/Assessment** delivers information sufficient to inform decision making regarding immediate lifesaving and life-sustaining activities and delivers enhanced information to reinforce these ongoing activities.
    ~~e.~~f. The HHS GeoHealth Portal incorporates information from numerous sources both internal and external to HHS and acts as a Common Operating Picture enhancing situational awareness for health information.
    ~~f.~~g. The DHS NOC Common Operating Picture (COP) application provides Homeland Security Enterprise professionals with enhanced situational awareness and a common operating picture for the entire Federal Government. Facilitating timely decision support prior to, or in the aftermath of a natural disaster, act of terrorism, or man-made disaster.
    ~~g.~~h. FEMA's GeoPlatform is an online web platform that provides users access to publically available geospatial data and analytics in support of emergency management and response.
    ~~h.~~i. Interior Geospatial Emergency Management System (IGEMS) provides the public with both an overview and more specific information on current natural hazard events.

Tradecraft includes access to training, operating procedures/guides, templates, and other resources. These resources are valuable in the Response Mission and provide guidance, use-cases that demonstrate successes or smart practices, training, and potential grant opportunities to support building, sustaining, and delivering geospatial capabilities. A list of Tradecraft resources available is provided below:

A list of types of resources available for the mission are below:

1. **Grants and financial assistance** can supply essential funding for staffing, training, data, software and infrastructure necessary to support the Response Mission. There are several ways of applying for grants or other financial agreements.
    a. The National Geospatial Intelligence Agency (NGA) overs several types of funding programs.
    b. The Homeland Security Grant Program supports state, local, and tribal efforts to support the National Preparedness Mission by providing federal funds to obtain the resources required. Focuses in FY 2017 include state homeland security, urban area security, and border security. More documentation on FY 2017 can be found here: https://www.fema.gov/media-library/assets/documents/131992.

2. It is important to **assess and understand an agency's current geospatial abilities** to determine geospatial strengths and weaknesses. The NAPSG Foundation's CARAT Tool is designed to serve as a roadmap for understanding an agency's readiness to support geospatial functions and can teach how GIS can be applied to public safety.

Figure 2: The CARAT and other capability assessment tools provide a framework for systematic analysis of current state and help plan for future desired levels of capability.

3. **Training** for analysts and those supporting the Prevention mission is essential in preparing for potential or imminent events. While each of these provides a range of trainings across their mission areas, geospatial offerings can increasingly be found within their course catalogs. The course range from self-paced online briefings to full instructor led courses in many cases.

    a. The FEMA Emergency Management Institute (EMI) has courses to prepare planners and responders for the potential effects of all types of disaster and emergencies.

Course Code	Course Title
IS-103	Geospatial Information Systems Specialist
IS-60.b	The Homeland Security Geospatial Concept-of-Operations (GeoCONOPS) for Planners and Decision Makers
IS-61.b	The Homeland Security Geospatial Concept-of-Operations (GeoCONOPS) In Depth
IS-62.b	The Homeland Security Geospatial Concept-of-Operations (GeoCONOPS) In Use
IS-63.b	Geospatial Information Infrastructure (GII)

Figure 3: FEMA's EMI web site provides a catalog of Independent study and instructor led courses.

4. **Concept of Operations -** The Homeland Security Enterprises Geospatial Concept of Operations (GeoCONOPS) includes community resources and capabilities, best practices, a catalog of authoritative data, and identification of technical capabilities, and is intended to support the geospatial community within the Homeland Security Enterprise.

5. **Standard Operating Procedures (SOPs)** supply structure, guidance and direction to analysts and decision makers on proper steps to take when using GIS to support the Prevention Mission. GIS SOPs serve as a shared foundation, encouraging improved communication and collaboration amongst GIS staff, operators, and decision makers.

    a. The NAPSG Foundation's Geospatial Standard Operating Guides (SOG) include templates and guidelines for coordinating geospatial emergency support efforts, including the prevention mission.

6. **Organization of human resources** can play an important role as it is essential to understand who and where people are that can support the mission.
    a. a. FEMA's Citizen Corps helps to coordinate volunteers' activities to make communities safer, stronger, and better prepared to response to an emergency.

b. The NSGIC Emergency Contact List is a regularly updated document containing contact information for geospatial professionals in Federal, state, and local agencies involved in supporting the HSE community.

Best Practices and Operating Procedures provide guidance and structure that promotes consistent application of geospatial capabilities and resources to meet the needs of elected officials, senior leaders, decision-makers, and operators responsible for coordinating a unity of effort to support meeting the needs of affected communities. Below are a few examples.

Environmental Protection Agency (EPA) Response to Hurricane Harvey

The EPA worked with the Texas Commission on Environmental Quality (TCEQ), the Texas General Land Office (TGLO), and the United States Coast Guard (USCG) to establish a Unified Command to begin evaluation, clean-up and recovery of spills, releases, and orphan containers. An EPA Response to Hurricane Harvey story map was created to explain this action more clearly and how the agency's responded to concerns about air and water quality, industrial facilities, debris, and superfund sites.

Oregon Office of Emergency Management (OEM) - RAPTOR

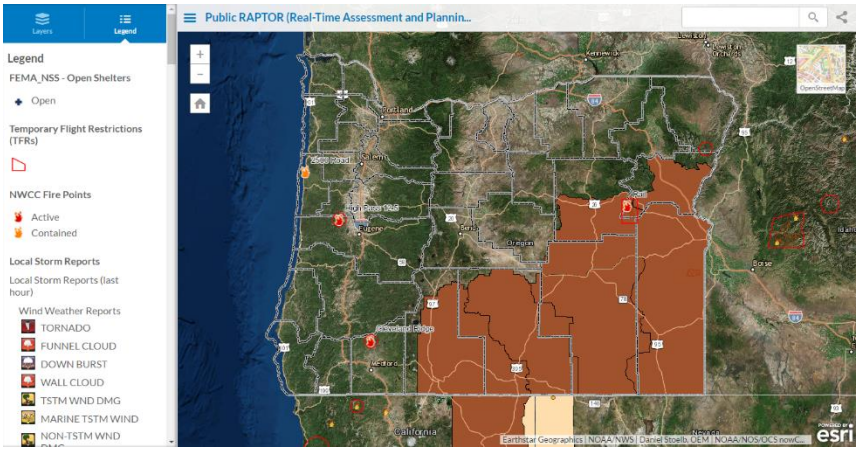
In 2009, the Science and Technology Directorate (S&T) of the U.S. Department of Homeland Security (DHS) launched the Virtual USA (vUSA) initiative, which helps to create a future where jurisdictions at all levels have the capabilities necessary to voluntarily share information with each other, as appropriate and authorized, regardless of the data format. The states of Alaska, Idaho, Montana, Oregon and Washington agreed to partner with DHS on a component of the Virtual USA Initiative, the Pacific Northwest (PNW) Pilot. The pilot advanced a technical and cultural shift in how the Nation shares information during an emergency.

Within Oregon, the State's Office of Emergency Management (OEM), Department of Transportation (ODOT), the Department of Administrative Services Geospatial Enterprise Office (DAS GEO) and Multnomah County's Department of Emergency Management agreed to partner on the development of a GIS-enabled situational awareness prototype (i.e. VENOM – the Virtual Emergency Network of Multnomah). On behalf of their partners, Multnomah County took the lead on technical development of the prototype while OEM, ODOT, and DAS GEO provided business requirements, access to vital information and geospatial datasets, and subject matter expertise. The prototype furnished a much needed virtual interoperability platform that allows collaboration and a coordinated response across the State's Emergency Management community. The tool was the first step towards new emergency management capabilities, offering real-time situational information in combination with 'traditional' Geospatial Information Systems (GIS) layers to create a comprehensive picture of existing and potential situations. VENOM also served as a prototype for Oregon's contribution to the Virtual USA (vUSA) Pacific NW Pilot.

As of October 2011, the State of Oregon's OEM and DAS rebranded the tool as RAPTOR – the Real-time Assessment & Planning Tool for Oregon. Now maintained solely by the State of Oregon OEM, RAPTOR is the web mapping application solution to allow users to display spatially enabled information from various resources and multiple agencies into a common platform. It can consume data from a variety of formats including shapefile, web service, and KML, and is strictly web based; requiring no additional hardware or software while also working on mobile devices. The application utilizes services made available through Federal and regional partners including the National Interagency Fire Center, NOAA,

FEMA, USGS, NWS, and DHS. The system also adopted the NAPSG symbology guidelines in order to have a standard symbol set which allows for an easier user experience.

Similar to a desktop system, users may add their own data, create points, lines, and polygons, and use draw or measure tools. Area of Concern Reports allow users to search for items in a particular area and find all the critical infrastructure within that may be affected by an event. Users can export attribute data to a pre-tabbed excel file for easy analysis. The Google Streetview resource was added to RAPTOR after users found it cumbersome to go back and forth between the application and the Google website. Driving directions are also available through the site which includes road closures brought in from the ODOT.



The creation and success of RAPTOR has lead the state to have both secure and public facing web mapping application sites. There are currently almost 900 users of the secure site including state, local, federal and public/private partners while the open site receives around 50 visits per day. The system has been used to support Oregon and surrounding areas in multiple emergencies including:

- 2014 Landslide – Displayed landslide impacts, tax lot data and building information. Worked with the State of Washington to pull in their data during the event in support of the effort.
- 2015 Extreme Heat – Used National Weather Service Watches and Warnings web service. Brought in information on cooling shelter locations to share with the public.
- 2015 Wildfires – Displayed Air Quality data from the EPA, evacuation areas, and fire perimeters to assist emergency management. Combined these resources with HIFLD critical infrastructure data to quickly identify which infrastructure was most at risk.
- Severe Winter Storms – Brought in road closure data from ODOT in addition to local storm reports from NOAA. Provided this information to FEMA in their Public Assistance package to better identify areas most affected.

For more information visit: https://www.oregon.gov/OMD/OEM/Pages/plans_train/RAPTOR.aspx

USE OF THE UNITED STATES NATIONAL GRID (USNG)

Effective preparedness for, response to, and recovery from large-scale and catastrophic incidents affecting multiple jurisdictions requires the use of a uniform point and area reference system. Lessons learned from several large- scale disasters1 within the past three decades highlight the need for a common, geographic reference system to anticipate resource requirements, facilitate decision-making, and accurately deploy resources. While existing data collection and geographic technologies support some decision-making requirements, integration of the USNG into these technologies allows them to deliver fully functional location-enabled decision support. Decision support tools that apply the USNG enable emergency managers to locate positions and identify areas of interest or operations where

traditional references (i.e., landmarks or street signs) may be destroyed, damaged, or missing as the result of a disaster. Implementing a common location reference for daily and disaster operations ensures familiarity and increases capability to consistently and accurately communicate critical location-enabled information in often austere environments of disaster operations.

The USNG is a point and area reference system that provides for actionable information using a uniform location language. Its use promotes consistent situational awareness across all levels of government, disciplines, threats and hazards – regardless of an individual or program's role. The USNG is functionally equivalent to the Military Grid Reference System (MGRS) in use by the Department of Defense and National Guard. The USNG is simple to teach, learn, and apply to decision support needed for risk assessment, planning, response, and recovery operations. It can be used within and across diverse geographic areas and disciplines, including by private citizens, public agencies, voluntary organizations, and commercial enterprises.

As described in FEMA DIRECTIVE 092-5, by adopting and implementing the USNG as the standard land-based location language communities of practice across the five mission areas will be better able to:

- Describe the location of disaster survivors and responders, and/or operational areas and requirements when GPS, existing mapping programs, or traditional landmarks are not reliable or available to responders;
- Advance implementation and sustain use of a nationally consistent location language that is seamless across agencies and jurisdictional boundaries and interoperable;
- Communicate location information and situational awareness to mutual aid partners that may be unfamiliar with communities and geographies they are responding to;
- Ensure resources operating within the same geographic area are required and appropriate and are not redundant;
- Use compatible location language across jurisdictions and mapping systems to communicate data across different platforms; and
- Identify and define geographic boundaries of potential and real-world incident sites using a common grid reference system for pre-scripted mission planning and management of resources during incident operations to more accurately address requirements in affected areas and potentially reduce costs.

HAZUS Concept of Operations

Prior to 2008, FEMA did not have a standardized process for using HAZUS for disaster response or a system to disseminate the output products for recovery operations. Recognizing the need to have an authoritative source for HAZUS modeling in support of the NRCC, GIS Solutions Branch (GSB), under the Office of Chief Information Officer (OCIO), developed the HAZUS Concept of Operations (CONOPS). This CONOPS is intended to define an official HAZUS run of record for FEMA, minimizing opportunities for conflicting HAZUS model data from entering the disaster response community.

With the development of the HAZUS CONOPS, FEMA took an important step to integrate HAZUS modeling into the suite of geospatial tools used by the NRCC to assess effects of a disaster that support decision making and response operations. While HAZUS has been used by FEMA for more than a decade to estimate losses from earthquakes, floods, and hurricanes, the CONOPS provides clear, official guidance for employing HAZUS by the GSB to support establishing situational awareness at the NRCC.

The HAZUS CONOPS outlines procedures for producing standardized Level 1 HAZUS runs of record for FEMA and the emergency management community. The CONOPS identifies the GSB Mapping Analysis Center (MAC) as the designated geospatial entity for producing HAZUS runs of record for FEMA. The HAZUS CONOPS defines operational deliverables, workflow, tools, and data sources for providing standardized Level 1 HAZUS hurricane, earthquake, and flooding products. The standardized products are intended to be disseminated through internal FEMA networks as well as HSIN.

The HAZUS CONOPS is an important contribution in the application of modeling to support disaster impact assessments. It is important that the SMEs running HAZUS are experienced in its use for disaster operations (rather than for planning purposes) and prepared to quickly and effectively interpret and share the modeled results. The HAZUS CONOPS fuses procedures required to guide the use of HAZUS together into a single authoritative document to support situational awareness and disaster operations.

FEMA

FEMA provides geospatial support for response missions through a coordinated interagency effort with the National Geospatial Intelligence Agency (NGA), US Forest Service (USFS), contractors, and others geospatial partners as needed. The response environment is dynamic with large quantities of initially ad hoc requests followed by frequent updates of event-specific standard products. Staffing positions are highly technical and it is imperative that geospatial practitioners are agile, dynamic, self-contained, and fully prepared for the unknown.

Search and Rescue (SAR) activities conducted through FEMA require on-site geospatial support to meet aggressive incident needs. In past events (e.g., 9/11 in New York City and Hurricane Katrina), dedicated GIS staff totaled over 20 individuals. Geospatial field support is essential to providing geospatial capabilities that effectively meets the unique needs and timelines of active SAR teams. On-site field support includes map production, data collection, and mission-specific analysis. Fixed support can include imagery analysis and data processing.

To facilitate simple and consistent georeferencing across the country, the US National Grid (USNG) is used by many SAR resources for sharing key geospatial information. Additional information on the USNG can be found in Appendix G.

Base geospatial data for response operations comes primarily from Homeland Infrastructure Foundation – Level Data (HFILD) Open and Secure as well as local sources collected on site.

There are several standard geospatial products used for all SAR operations. These standards are augmented by a multitude of ad hoc products focused at answering incident-specific questions. Some are “one-off” products and others evolve into standard products that are unique to an event.

SAR products include, but are not limited to:

- Operational Management
- Mission Tracking
- Base of Operations
- Area Management
- Safety

- Resource Tracking
- Search Planning
- Flight Planning
- Tactical Missions
- Search Tasking
- Search Status
- Transportation Plans

Department of Health and Human Services (DHHS) (Critical Medical Support)

Public Health and Medical Services leads efforts to provide critical public health and medical support during disaster operations. These services must be available immediately after an incident, when permanent resources and facilities are damaged or overwhelmed by a disaster.

The Emergency Management Group (EMG), operating from the DHHS Secretary's Operations Center (SOC), coordinates the overall national ESF #8 response and maintains constant communications with the National Operations Center (NOC). Geospatial staff supporting the DHHS SOC and ESF roles with the NRCC, RRCC, and JFO provide products that support risk analysis, needs evaluations, and determining resources required to meet mission objectives and provide public health and medical support to local, state, and tribal officials.

With efforts focused primarily on analysis and deployment of resources, many of the data compiled are simple resource tracking files consisting of basic point references for field operations.

Products supporting the Critical Medical Support Mission include, but are not limited to:

Lifesaving Activities

- Evacuation areas and routes
- Special needs populations
- Urgent transport

Resource Deployments

- Medical team deployments
- Commodity caches

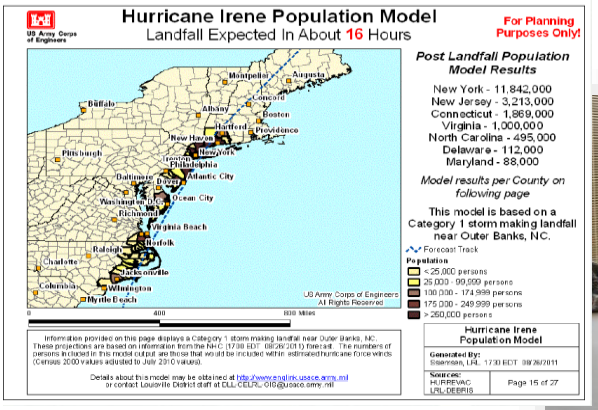
Impact Assessments

- Damaged facilities
- Resource Requirements

Use-Case Scenarios provide opportunities to explore examples and understand how the geospatial community works to unify operations that integrate and synchronize existing geospatial capabilities to support Response Mission activities and critical tasks.

Hurricane Scenario

Hurricane Irene first struck the U.S. mainland as a Category 1 hurricane in eastern North Carolina on August 27, 2011, then moved northward along the Mid-Atlantic Coast. Wind damage in coastal North Carolina, Virginia, and Maryland was moderate, with considerable damage resulting from falling trees and power lines. Irene made its landfall as a tropical storm in southeastern New Jersey on August 28 and dropped torrential rainfall in the Northeast that caused widespread flooding. More than 7 million homes and businesses lost power during the storm, and Irene caused at least 45 deaths and more than $7.3 billion in damages.



Planning

A planning team is assembled to create a response plan. The plan is based on modeled consequence analysis and geospatial studies of affected areas and populations.

Public Information and Warning

Affected populations must be provided with current information about protective measures, resources, assistance, and incident information in an effective and accessible manner. Integrated Public Alert and Warning System (IPAWS) provides a broad range of message options and communications pathways for delivering alert and warning information before, during, and after a disaster.

Shelter and Housing

HAZUS-MH and other models can be used to project displaced households and survivors who will likely seek shelter. In addition to local or state datasets, the Red Cross National Shelter System (NSS) provides data for potential shelter facilities in support of disasters. Large-scale, complex, or catastrophic disasters may require a coordinated national effort to develop disaster housing strategies, which can be informed by modeling impacts to housing and analysis of housing needs and availability. Geospatial resources and capabilities should also be

employed to ensure community housing recovery plans communicate risk, address interim housing needs, and convey potential solutions or strategies for meeting the needs of displaced households affected by a disaster in their community.

Critical Food, Shelter, and Water

Following an event, many communities require assistance with basic needs for survival: water, shelter, and food. These critical resources must be available quickly to sustain life. ESF #6 – Mass Care, Emergency Assistance, Housing, and Human Services is led by DHS/FEMA and coordinates efforts of federal and national organizations to provide basic needs to affected communities. This section focuses on topics within the two primary functions supporting disaster response efforts under ESF #6.

Information management systems such as the National Shelter System (NSS) are constantly used and maintained during a crisis. The NSS is a comprehensive web-based database with geospatial capabilities that provides information for shelters during response to disasters and emergencies. Reports from the NSS detail the location and capacities of shelters (evacuation, general, ADA compliant, pet friendly, medical, etc.) open, on stand-by, or closed. Information contained in the NSS is submitted by the local, state, and tribal voluntary agencies (VOLAG) operating shelters. NSS information is also used to support reunification and evacuations (including registration and tracking of evacuees).

Bulk distribution of emergency commodities includes the distribution of emergency relief items to meet urgent needs through points of distribution established within affected areas to distribute food, water, or other commodities in coordination with local, state, territorial, tribal, and federal governmental entities as well as VOLAGs and other private sector organizations. Before, during, and after a disaster, authoritative data is essential for projecting consequences and survivor needs. It is important to note that data related to survivors is sensitive by nature and personal identifying information (PII) is protected by the Privacy Act.

Geospatial products developed to support analysis and delivery of critical food, shelter, and water come from many different sources (contractors, non-profits, local, state, tribal, and federal resources). Examples of geospatial products include, but are not limited to:

Shelter

- Locations with sponsor information, populations, etc.
- Population analysis: home location, income, relations to others

Food and Water

- Operation locations with capacities
- Commodity storage
- Requirement analysis Distribution
- Points of distribution (PODs) locations
- Staging areas
- Requirement analysis

- Tracking of commodities distributed
- Delivery locations